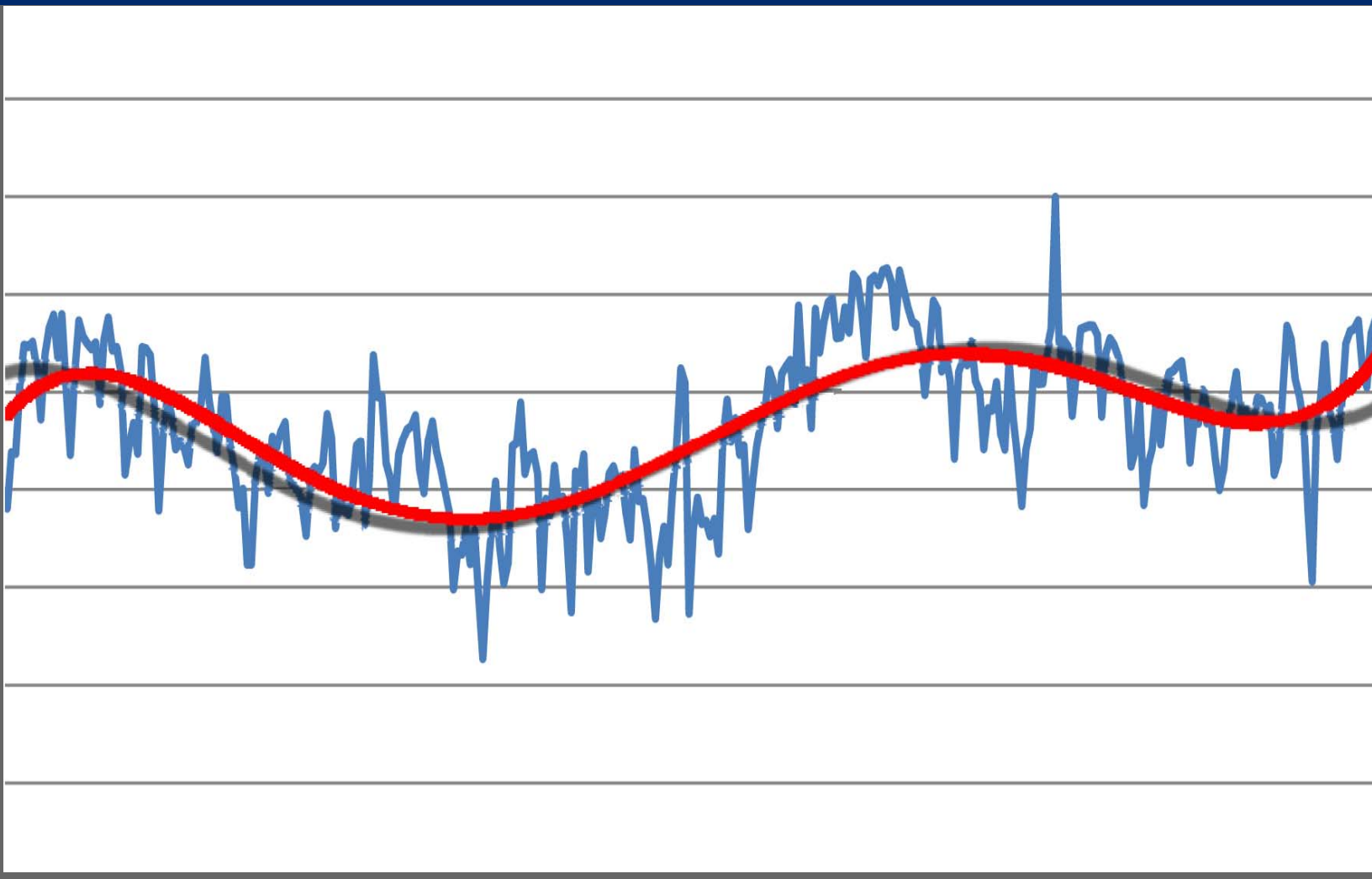
USAID FROM THE AMERICAN PEOPLE

Hydropower Investment Promotion Project (HIPP)

Turkish Power Market Monthly Report (January 2012)



This publication was produced for review by the United States Agency for International Development. It was prepared by Deloitte Consulting in collaboration with Black & Veatch and Pierce Atwood LLP

Turkish Power Market Monthly Report (January 2012)

USAID HYDROPOWER INVESTMENT PROMOTION PROJECT (HIPP)

CONTRACT NUMBER: EEM-I-00-07-00005-0

DELOITTE CONSULTING LLP

IN COLLABORATION WITH BLACK & VEATCH AND PIERCE ATWOOD LLP

USAID/CAUCASUS OFFICE OF ENERGY AND ENVIRONMENT

MONDAY, FEBRUARY 06, 2012

This document was prepared by

Author	Organization	Contact Details
Nikoloz Sumbadze	Deloitte Consulting	nsumbadze@dcop-hipp.ge +995-32-24-45-70/71
Reviewer	**Organization**	**Contact Details**
Neka Danelia	Deloitte Consulting	ndanelia@hipp-dcop.ge +995-32-24-45-70/71
Adrian Rouse	Deloitte Consulting	adrouse@deloitte.com +995-599-28-72-07

TABLE OF CONTENTS

Acronyms Used in this Report

BOTAS	Petroleum Pipeline Transportation Company
DAM	Day-Ahead Market
GWh	Gigawatt Hours
HIPP	Hydropower Investment Promotion Project
HPP	Hydro Power Plant
KGÜP	Final Day Ahead Production / Consumption Program (Kesinleşmiş Gün Öncesi Üretim/Tüketim Programı)
kWh	Kilowatt Hours
MCM	Million Cubic Meter
MkWh	Million Kilowatt Hours
MWh	Megawatt Hours
PMUM	Market Financial Reconciliation Center (Piyasa Mali Uzlastirma Merkezi)
SDV	System Demand Volume
USD	United States Dollar
USc	US Dollar Cents

Executive Summary

- USAID's Hydropower Investment Promotion Project intends to help facilitate private sector development of at least 400 MW of new, climate friendly hydropower in Georgia. This report has been published in support of this goal.
- Turkey has been identified as a potential export market for Georgian electricity. This report provides an analysis of power market prices and developments in Turkey, thereby enabling potential private sector developers, governments, IFIs and other stakeholders to better understand the economics of investment into the Georgian hydropower market.
- In January, gross electricity generation in Turkey increased by 9.6% y-o-y to 21,388 GWh, while gross electricity demand was 21,310 GWh. During this month, Turkey exported 466 GWh of electricity and imported 388 GWh of electricity.
- January 2012 was the second full month of activity on the DAM.
- The number of members registered on the DAM in January 2012 increased by 2% to 536, compared to 525 in December 2011.
- Total trading volume in January decreased by 0.87% to 3,705 GWh compared to 3,737GWh in December 2011.
- Total turnover on the Turkish DAM in January 2012 increased by 1.2% to 313.3 million USD compared to 309.6USD in December 2011.
- In January, trading volume on the Turkish DAM accounted for 18.8% of realized physical demand compared to 19.7% in December 2011[1].
- January's peak price hour was during 17:00-18:00 on Thursday; 19January when electricity demand reached 28,899 MWh. Off-peak price hour was recorded during 04:00-05:00 on Monday, 2 January when electricity demand reached 20,093 MWh.
- DAM prices did not change significantly compared to December 2011 prices. The average price for January 2012 was 8.09 USc/kWh; maximum and minimum DAM prices were 21.95 USc/kWh and 0.53 USc/kWh, respectively.
- Maximum SDV was 33,219 MWh, whereas minimum and average SDV were 19,116 MWh and 26,428 MWh, respectively.
- Daily trading volumes on the DAM ranged from a low of 3,199 MWh toa high of8,425 MWh; average daily trading volume was 4,980 MWh.

[1]We estimated the difference between actual monthly production and KGUP monthly production at 8% in December. (Total sum of KGUP production for December was 19,662 GWh, while for the same time period actual production was 21,387 GWh).

1. Introduction

In early 2011, the USAID-funded HIPP created the Special Studies Group to provide analysis of the Georgian and regional electricity markets as well as to support the electricity market research needed for the Investment Promotion Group within HIPP. The Turkish electricity market is the focal point of energy sales from new Georgian HPPs and there appears to be strong interest in power market developments in Turkey from many potential HPP developers, governments and other stakeholders.

Turkey has been identified as a potential export market for new Georgian electricity. By examining the hourly prices and volumes of the Turkish DAM, this report intends to help potential private sector developers, governments, IFIs and other stakeholders to better understand the economics of investment into the Georgian hydropower market.

This report analyzes the hourly prices and volumes of the Turkish DAM for the examined month. Historical data on final day-ahead production volume, peak, off-peak and shoulder-peak prices used in this report are based on data available from the TEIAS/PMUM website[2].TL/USD exchange rates have been calculated using data from the Central Bank of Turkey's website, including weekend exchange rates that are calculated using the last preceding working days' exchange rate. In addition, *The Turkish Power Market Monthly Report* examines total turnover changes together with DAM's share in total forecasted demand. The figures on economic parameters are based on Central Bank of Turkey's *Monthly Price Development Report* for January 2012 and its *Inflation Report* for Quarter I. The remainder of this report is structured as follows. Section 2 provides an overview of developments in the Turkish economy during the month under study. Section 3 provides an outline of the Turkish DAM and basic statistical information for January 2012. In addition, a comparison with December 2011 is conducted. Section 4 provides analysis of Turkish DAM prices and volumes within the month, its week and hours, as well as providing a DAM volume data analysis. Finally, information and sources for raw data and other relevant materials are provided in the appendix.

2. Synopsis of Turkish Economy

In January, Turkey's annual inflation reached 10.61%, the highest since November 2008. According to the Central Bank of Turkey[3] and the Turkish Statistical Institute[4], the steep rise in inflation was accompanied by strong economic growth, continuing a trend established in 2011 when the Turkish economy expanded by 8.2%. While inflation is expected to remain high during the first quarter, it is forecast to fall from quarter two onwards. Inflation was driven by a deprecating Turkish Lira and an outflow of short-term

[2]Market Financial Reconciliation Center, http://dgpys.teias.gov.tr/dgpys/

[3] Central Bank of Turkey, www.tcmb.gov.tr

[4] Turkish Statistical Institute (TurkStat), www.turkstat.gov.tr

funds. These factors together with increased growth in domestic demand and rising oil prices drove up Turkish electricity prices in the first quarter of 2012. Energy prices rose by 2.19% y-o-y in January 2012 compared to a 0.56% y-o-y increase in December 2011. As well as domestic economic factors, this was caused by bad weather conditions, higher municipal water tariffs and higher international oil prices. Consequently, Turkish electricity prices went up by 1.02% in the month under examination.

In January, extreme cold weather significantly increased electricity demand. Daily electricity consumption reached 733 Mk Wh. Turkey maintained near uninterrupted service during the month, aside from a few temporary outages. For instance, in January 14thdue to technical failure on a main power transmission line, most of Istanbul and north-western Turkey were left without electricity. The electricity blackout was caused by excessive snowfall, which caused a failure at a power plant in the city of Bursa[5].

3. Synopsis of Turkish DAM

During January, the second full month of DAM opening, the total number of market participants increased by 2% against the previous month, most noticeably, the share of private companies. The number of admitted members was 536 in the examined period.

Table 1. Distribution of DAM Market Participants

License Type	December 2011		January 2012	
	Public	Private	Public	Private
Production	6	250	6	261
Auto Producers	1	124	1	125
Wholesale	1	121	1	120
Retail	9	12	9	12
Auto Producers Group	0	1	0	1
Total	**17**	**508**	**17**	**519**

In the first month of 2012, total turnover amounted to 309.5 million USD compared to 313.8 million USD in December 2011. Total trading volume in the DAM during the month was 3,705,246 MWh compared to 3,737,854 MWh in December 2011.

[5] CNN news/article

Table 2. Summary of Prices and Turnover			
Description	**12/2011**	**01/2012**	**Change**
Base Average (USc/kWh)	8.03	8.09	0.75%
Peak Average Price (USc/kWh)	8.96	9.34	4.24%
Off-Peak Average Price (USc/kWh)	6.38	6.04	-5.33%
Shoulder-Peak Average Price (USc/kWh)	8.34	8.32	-0.24%
Highest Traded Price (USc/kWh)	16.28	21.95	34.83%
Lowest Traded Price (USc/kWh)	1.07	0.53	-50.47%
Total Turnover (USD)	309,574,633	313,382,471	1.23%
Average Hourly Turnover (USD)	416,094	421,213	1.23%
Maximum Turnover (USD)	1,123,302	1,521,540	35.45%
Minimum Turnover (USD)	37,250	20,195	-45.79%
Average Weekdays Price (US c/kWh)	8.20	8.22	0.24%
Average Weekdays Turnover (USD)	433,795	428,567	-1.21%
Average Weekend Price (US c/kWh)	7.70	7.77	0.91%
Average Weekend Turnover (USD)	372,826	403,234	8.16%

Table 3. Summary of Volumes			
Description	**12/2011**	**01/2012**	**Change**
Total Volume(MWh)	3,737,854	3,705,246	-0.87%
Highest Traded Volume (MWh)	7,587	8,425	11.05%
Lowest Traded Volume (MWh)	2,735	3,199	16.97%
Average Traded Volume (MWh)	5,091	4,980	-2.18%
Highest System Demand Volume (MWh)	31,900	33,219	4.13%
Lowest System Demand Volume (MWh)	19,478	19,116	-1.86%
Average System Demand Volume (MWh)	26,155	26,428	1.04%
Average Weekdays Traded Volume (MWh)	5,141	5,006	-2.63%
Average Weekend Traded Volume (MWh)	4,737	4,916	3.78%
DAM's share in total forecasted demand (%)	19.7	18.84	-4.37%

Note:

Base average price contains an average of all the hourly prices in the examined periods. Peak, off-peak, and shoulder-peak average prices and the highest and lowest traded price contain prices for already determined peak, off-peak and shoulder-peak hours and maximum and minimum prices during the two years. Total volume describes the volume of electricity traded in the DAM. System demand volume represents total volume of electricity consumed in the Turkey.

4. Analysis of Turkish DAM Activities in January, 2012

The Turkish DAM is characterized by hourly and even weekly fluctuations in price spikes and production volumes. However, in the aggregate, trading volumes and strike prices continue to grow. In January 2012 electricity production increased by 9.6% compared with the previous year. In HIPPs *Turkish Electricity Price Curve Analysis Report,* three price clusters were identified: peak, shoulder-peak and off-peak hours. This report uses these clusters to analyze electricity price dynamics in the month under study. During this month, peak hours were categorized during 11:00-19:00, whereas off-peak hours were between 02:00-08:00 and shoulder peak hours were 08:00-11:00 and 19:00-02:00.

PMUM's web site provides day-ahead demand and production forecasts. Data is also provided on KGUP that is the final schedule of the next day's production after day-ahead bidding[6]. HIPP uses KGUP as a proxy for demand on the Turkish power market.

Table 4. Comparison of DAM Variables

Year	Variables on Hourly Basis	January, 2011	January, 2012	Change
DAM Price (US c/kWh)	Max	11.80	21.95	86.02%
	Average	8.32	8.09	-2.76%
	Min	0.7	0.53	-24.29%
Trading Volume on the DAM (MWh)	Max	4,646	8,425	81.34%
	Average	2,057	4,980	142.10%
	Min	109	3,199	2834.86%
System Demand Volume (MWh)	Max	29,620	33,219	12.15%
	Average	23,900	26,428	10.58%
	Min	17,408	19,116	9.81%

The data in Table 4 shows there was significant y-o-y change in key market variables. Average SDV increased by 10.6%, driven in part by strong economic growth. Trading volumes also rose sharply. The average strike price in January 2012 was a little lower than 2011, which we believe is partly due to increased hydro plant output offsetting strong electricity demand. The maximum price on the DAM in January 2012 was almost double a year earlier, caused in part by bad weather conditions and a shortage in gas supply.

[6] We estimated the difference between actual monthly production and KGUP monthly production at 8% in December. (Total sum of KGUP production for December was 19,662 GWh, while for the same time period actual production was 21,387 GWh).

Figure 1. Average System Load and Prices by Hours, January 2011 vs 2012

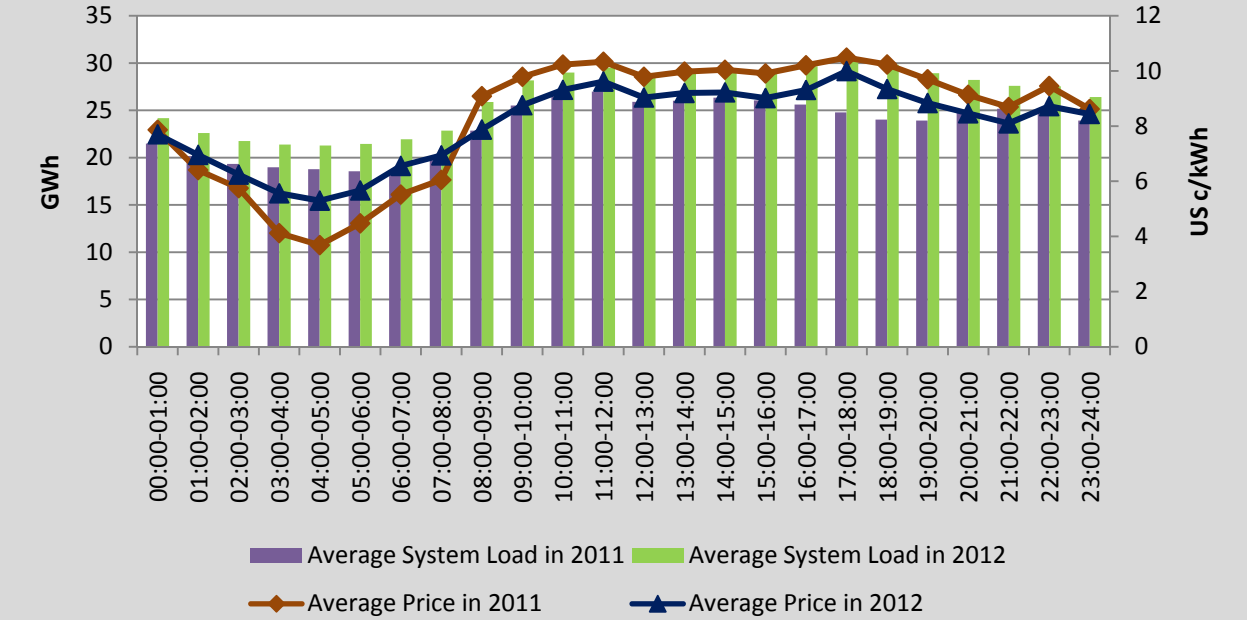
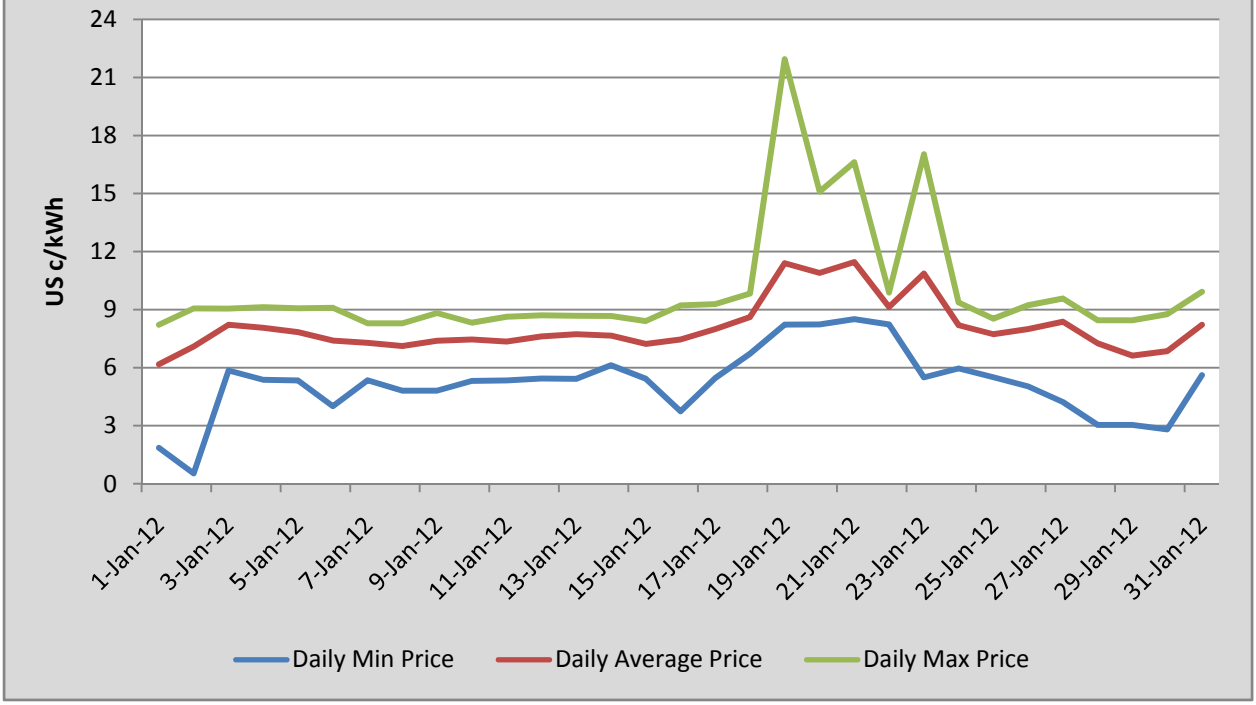


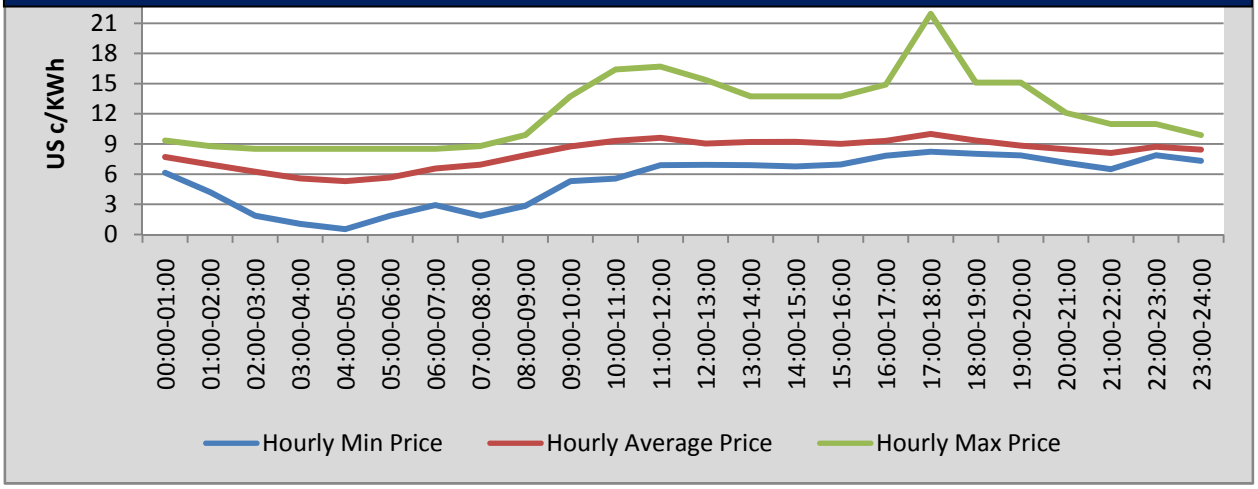
Figure 1 describes the variations in system loads and prices between January 2011 and January 2012. On average, during 09:00-23:00,January 2012 prices were lower than January 2011's DAPM prices. This is probably due to increased domestic electricity output and participation on the exchange from lower cost hydro sources. However, during the early morning until 9 a.m. January 2012 prices were higher than January 2011.

Figure 2. Hourly Minimum, Average and Maximum Prices in the DAM, Jan 2012



As seen in Figure 2, prices spikes occurred from January 19th until January 23th. Electricity and gas shortages and outages, coupled with increased domestic demand due to cold weather conditions, were the main causes. Figure 3 below provides minimum, average and maximum price distributions by hour for the same month.

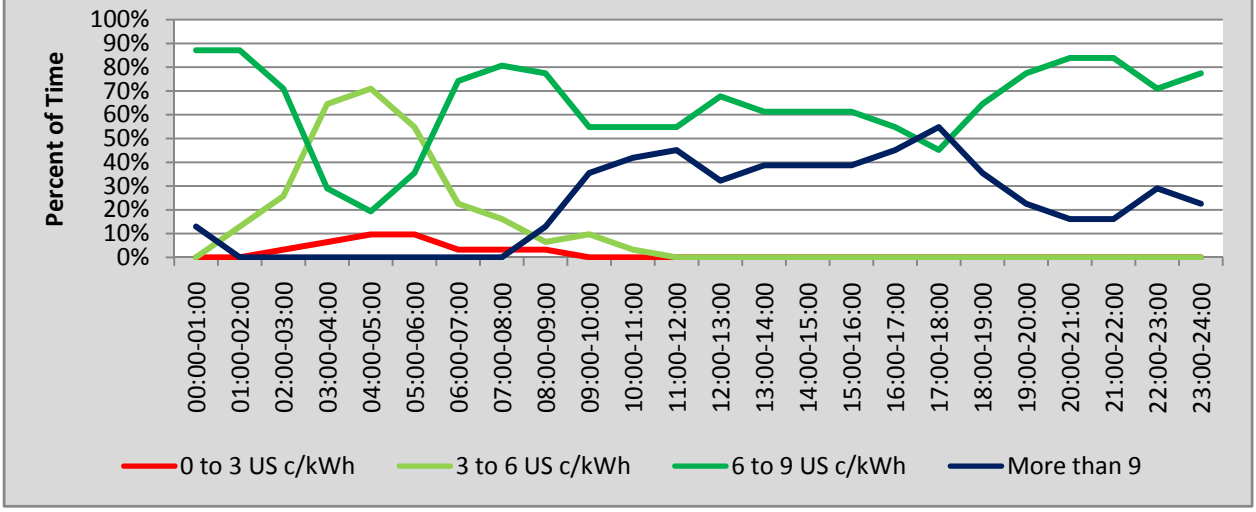
Figure 3. Hourly Minimum, Average and Maximum Price in the DAM, Jan 2012



4.1. Price Sub Groups on the Turkish DAM

In Figure 4, we use PMUM data to group hourly kWh prices in four price bands. We categorize results according to prices in each hour.

Figure 4. Distribution of Price Ranges



Below 3 US c/kWh. The total number of hours when prices were below 3 US c/kWh was 12 out of a total 744 hours under study. This price band occurred during Off-peak

hours though it has an insignificant share in the total hours. During peak and shoulder peak hours, prices below 3 US c/kWh were not recorded.

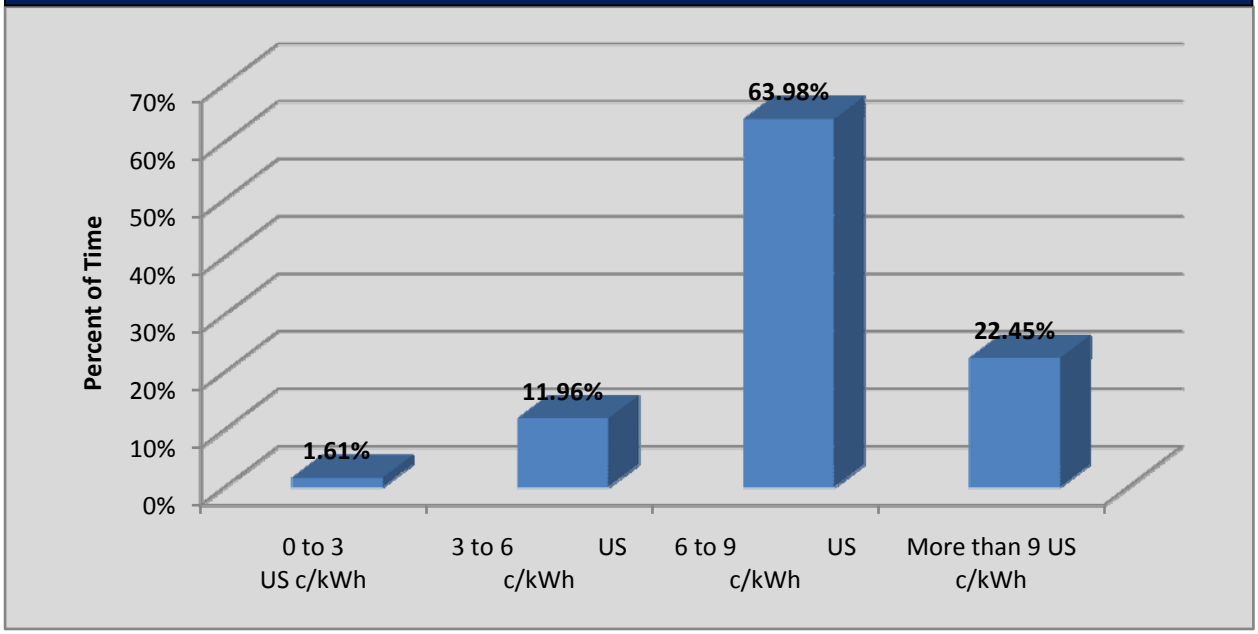
***3 to 6 US c/kWh*.** This price range follows a similar trend. The total number of hours for this range was 89, mostly recorded during off-peak hours. For the shoulder-peak period, hours when prices were noted between 3-6 US c/KWh are 10while for the peak periods this price band was not recorded.

***6 to 9 US c/kWh*.** There were 476 hours in this price band during January 2012, 65 of which occurred during shoulder-peak and 102 of which occurred during peak hours.

***Over 9 US c/kWh*.** Prices in this band accounted for 167 hours of the total 744 hours. During off-peak hours, sales activity in this price band were not noted. The total number of peak and shoulder-peak hours in this price band was 102 and 65 respectively.

Figure 5 provides distribution by price band for the period under study.

Figure 5. Distribution by Price Range, January 2012



4.2. Price Curve Dynamics by Week-Days

Figure 6 shows that maximum and average electricity prices were high during weekdays, while electricity prices decreased during weekends, as electricity demand softens.

Figure 6. Price Dynamics by Weekdays, January 2012

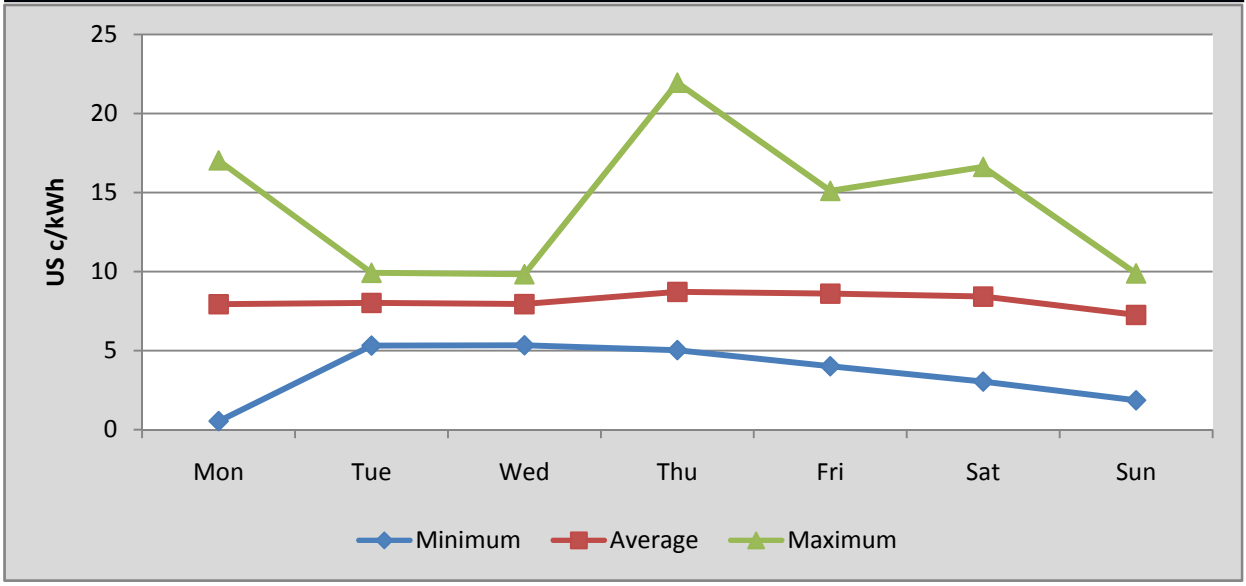
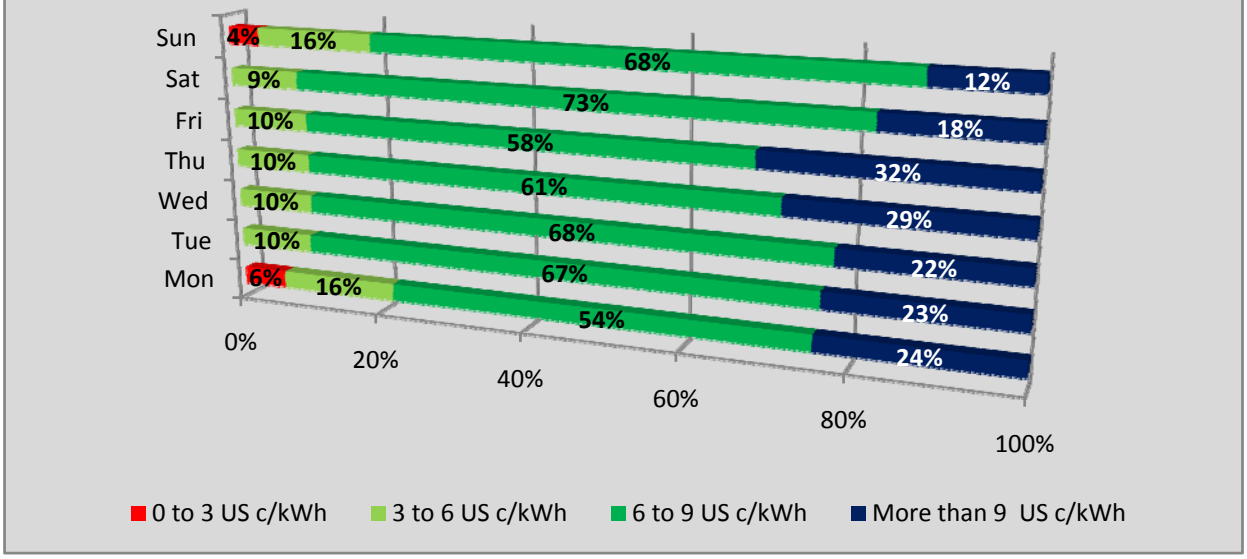


Figure 7 provides a comparision of price bands within weekdays. Prices below 3 USc/kWh were higher during weekends. Prices between 3-6 USc/kWh occurred on all weekdays, but had a far lower share than prices over 6 USc/kWh. During the week, prices were over 9 USc/kWh for more than around 30% of the time.

Figure 7. Price Range Breakdown by Weekdays



DAM Volume Data Analysis

Figure 8 illustrates daily production in the entire Turkish power market and the share of the DAM.As is shown, system loads are significantly lower during weekends in Turkey. However, traded electricity volumes in the DAM did not follow weekly system load shapes. In other words, on Saturdays and Sundays, system load is low but DAM trading volumes do not fall. This explains why the dashed line on the graph is acyclic to the system daily production, thereby indicating an increasing share of trading volume as a portion of total system load during weekends.

Figure 8. Daily Electricity Production and Share of the DAM, Jan 2012

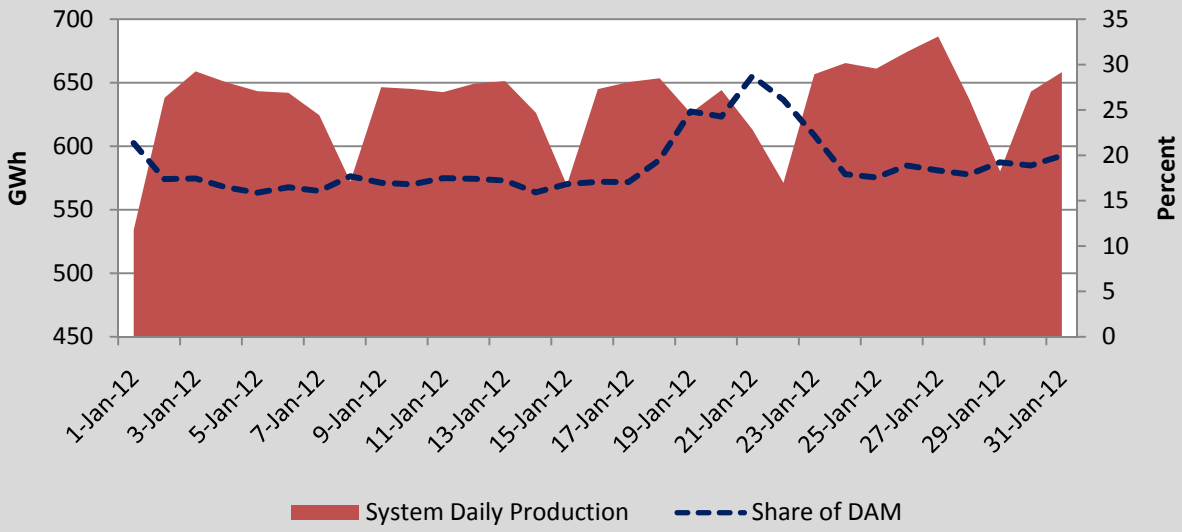


Figure 9 provides distribution of MWh trading volumes by group in the Turkish DAM.

Figure 9. Traded Volume Groups in the DAM, Jan 2012

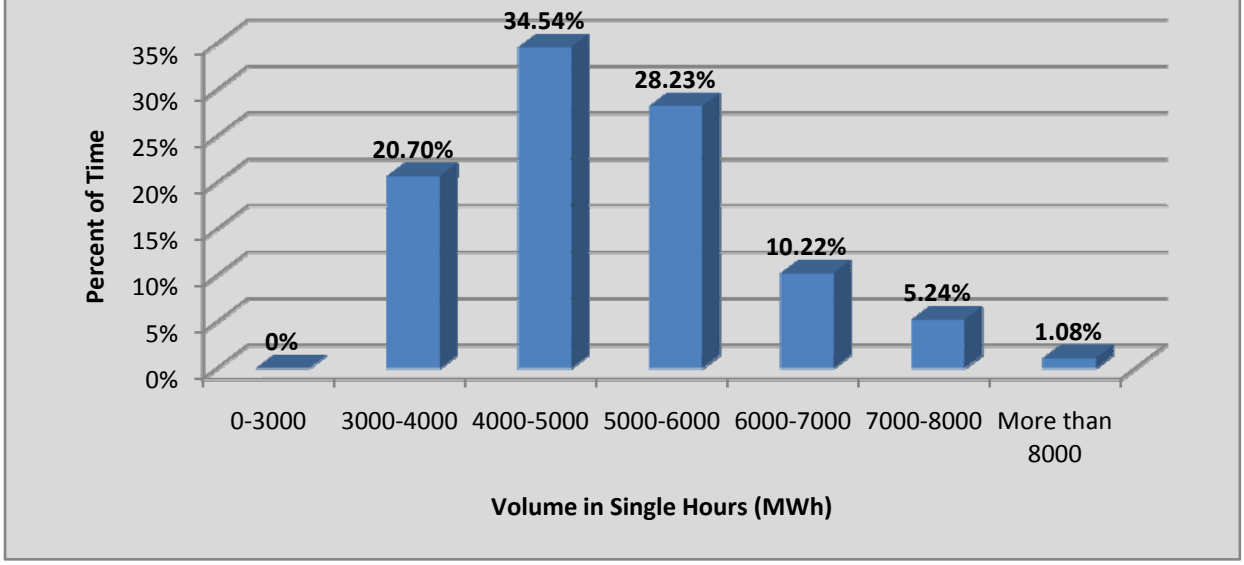
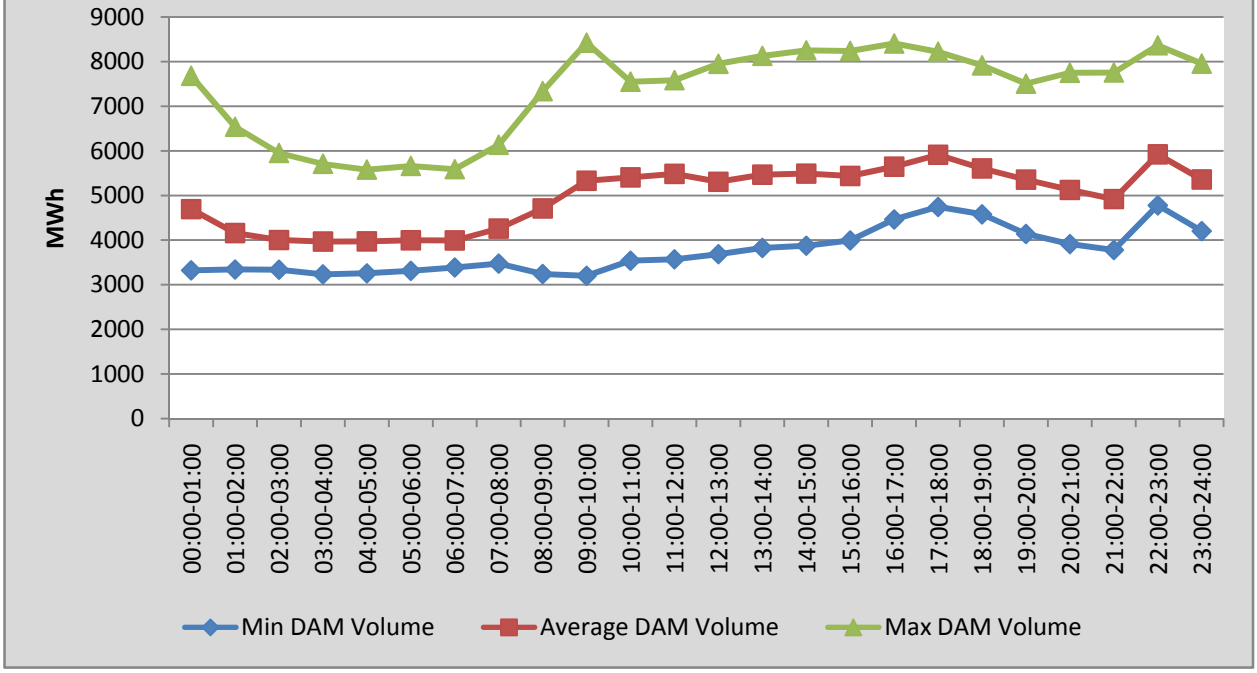


Figure 10 shows minimum, average and maximum hourly trading volume by MWh in January 2012.

Figure 10. Hourly Minimum, Average and Maximum Volumes in the DAM, Jan 2012



Appendix

Source materials used in this report can be found at the following locations.

1. Hydropower Investment Promotion Project, www.hydropower.ge
2. Market Financial Reconciliation Center (PMUM), http://dgpys.teias.gov.tr/dgpys/
3. Market Financial Reconciliation Center (PMUM), www.pmum.gov.tr
4. Turkish Electricity Transmission Corporation, www.teias.gov.tr

USAID Hydropower Investment Promotion Project (USAID-HIPP)

Deloitte Consulting Overseas Projects - HIPP

13th floor, 11, Apakidzestr, Tiflis Business Center,

Tbilisi, 0171, Georgia